



STANFORD RESEARCH INSTITUTE
Menlo Park, California 94025 · U.S.A.

PHYSICS, ENTROPY, AND PSYCHOKINESIS

Harold Puthoff and Russell Targ

**Stanford Research Institute
Electronics and Bioengineering Laboratory**

To be presented at the Conference on Quantum Physics and Parapsychology
Geneva, Switzerland, August 26-27, 1974

In this paper we present results of recent experiments at Stanford Research Institute which indicate anew that certain individuals are capable of producing physical effects in the environment by means of some as yet unidentified modality, generally referred to as psychic or psychoenergetic.

Such phenomena have of course been under scientific consideration for over a century. However, even a cursory review of the literature reveals that in spite of well-conducted experiments by reputable researchers yielding reproducible results (e.g., Sir William Crookes' study of D.D. Home, or von Reichenbach's researches as reported in The Dynamics, London, 1851), the study of these phenomena has never emerged from the realm of quasi-scientific speculation. One reason for this is that, in spite of experimental results, no satisfactory theoretical construct has to date been advanced to correlate data or predict new experimental outcomes. Consequently, the area in question remains in the recipe stage reminiscent of electrodynamics before the unification brought about by the work of Ampere, Faraday, and Maxwell.

The overall goal of our research program is the determination of the laws underlying these phenomena. That is, our goal is not just to catalog interesting events, but rather to uncover patterns of cause-effect relationships of the type that lend themselves to analysis and hypothesis in the form with which we are familiar in scientific study. The results presented here constitute for us a first step toward that goal, in that we are establishing under known conditions a data base from which departures as a function

of physical and psychological variables can be studied in future work. Our observations to date have led us to conclude that such phenomena can be studied under laboratory conditions. It is our expectation that with the sensitive instrumentation and powerful theoretical tools presently available, progress in this field will be forthcoming.

Magnetometer Observation (Pilot Experiment)

One of the first psychoenergetically-produced physical effects observed by SRI personnel (H.P.) in early research (1972) was the apparent perturbation of a superconductor-shielded Josephson effect magnetometer by a gifted subject, Mr. Ingo Swann. Following is a fairly detailed account of that first observation, since it reveals a number of aspects of PK research that we consider to be of significance.

This magnetometer is located in a well under a building and is shielded by μ -metal shielding, an aluminum container, copper shielding and, most important, a superconducting niobium shield. (See Fig. 1). The magnetometer is of the superconducting quantum interference device (SQUID) variety, which has an output voltage whose frequency is a measure of the rate of change of magnetic field present.

Before the experiment, a decaying magnetic field had been set up inside the magnetometer, and its decay with time provided a background calibration signal that registered as a periodic output on an x-y recorder, the frequency of the output corresponding to the decay rate of the calibration field ($\sim 10^{-6}$ Gauss). The system had been running for about an hour with no noise.

Mr. Swann was shown the setup and told that if he were to affect the magnetic field in the magnetometer, it would show up as a change in the output recording. Then, to use his own description, he placed his attention on the interior of the magnetometer, at which time the frequency of

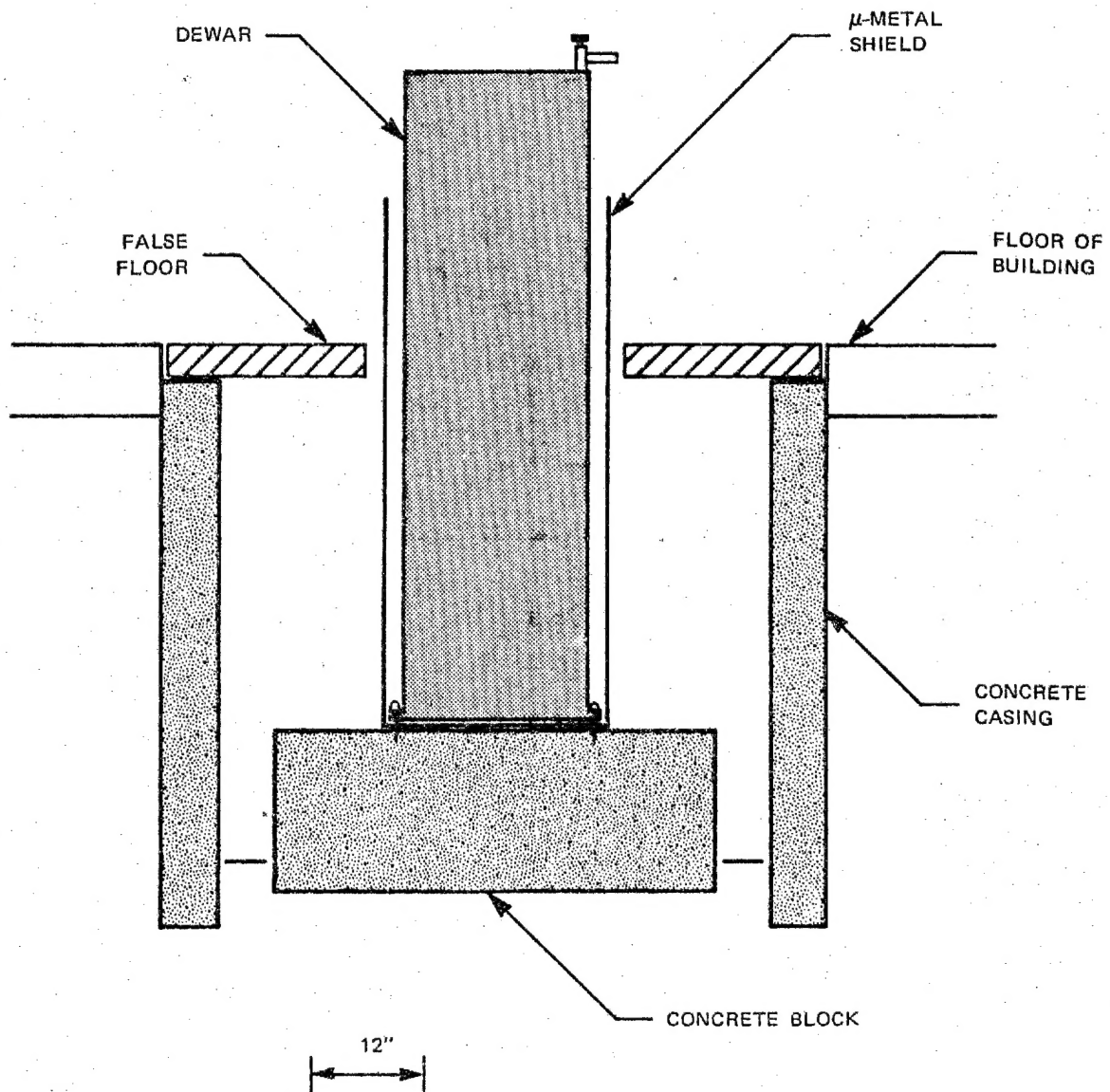
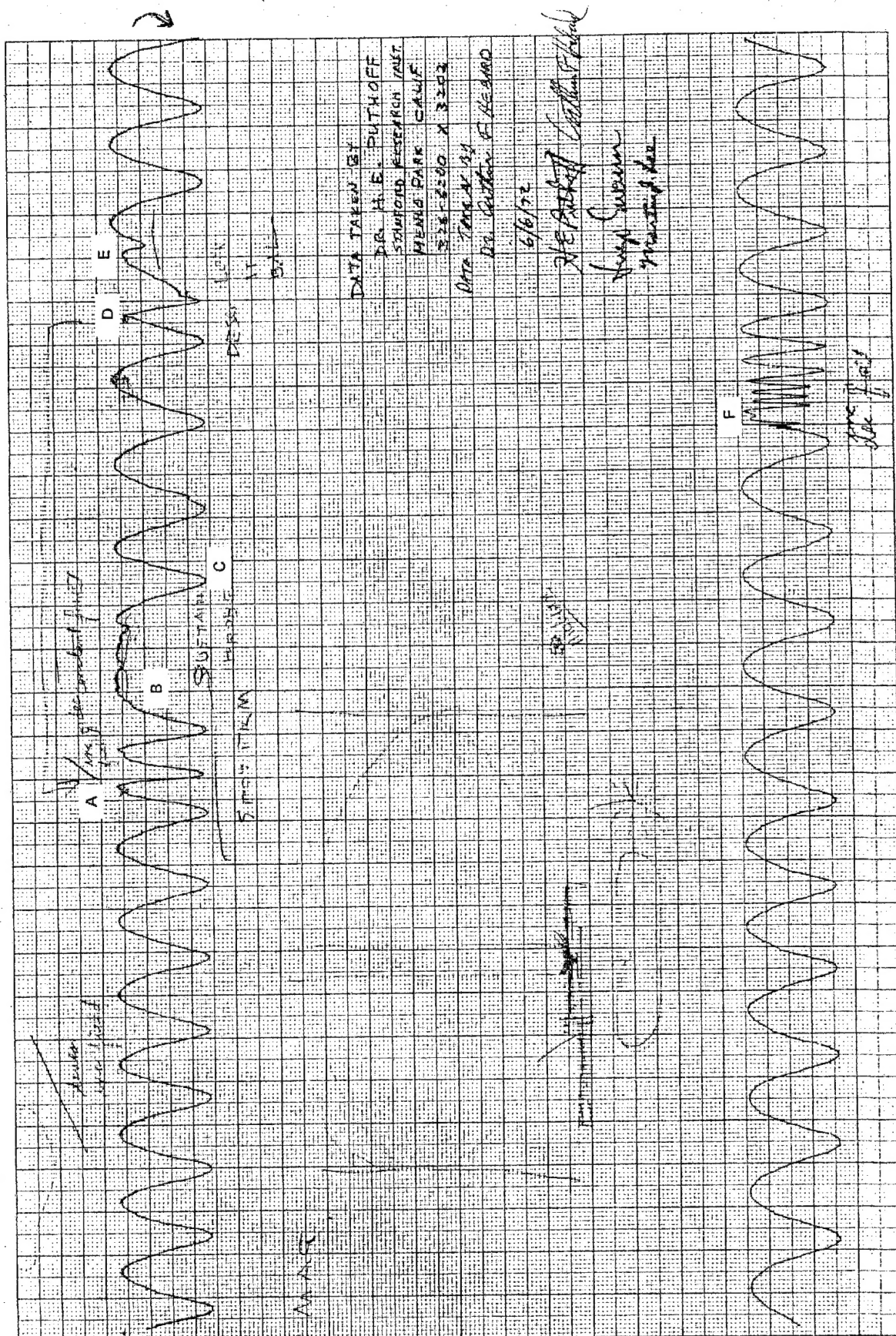


FIGURE 1 MAGNETOMETER HOUSING CONSTRUCTION

the output doubled for about two of the cycles or roughly thirty seconds. This is indicated by A in Figure 2. Mr. Swann was next asked if he could stop the field change being indicated by the periodic output on the recorder. He then apparently proceeded to do just that, as can be seen at B in the graph, for a period of roughly forty five seconds. He then "let go," at which time the output returned to normal (C). Upon inquiry as to what he had done, he explained that he had direct vision of the apparatus inside and that the act of looking at different parts seemed to him to be correlated with the different effects. As he described what he was doing, the recording again traced out a double frequency cycle (shown at D), as had occurred before. An atypical dip (E) in the recording took place then, and on questioning him about what was happening, he said he was looking at a new part, the niobium ball sitting in a cup. This ball was inert at the time, not being used in the magnetometer experiment. He was asked to refrain from thinking about the apparatus, and the normal pattern was then traced out for several minutes (continued on lower trace) while he was engaged in conversation on other subjects. At one point he started to discuss the magnetometer again, at which point the tracing went into a high frequency pattern, shown at F. At our request he stopped, and the observation was terminated because Mr. Swann was tired from his effort. We then left the lab, while the apparatus was run for over an hour with no trace of noise or nonuniform activity, as indicated in Figure 3, where the



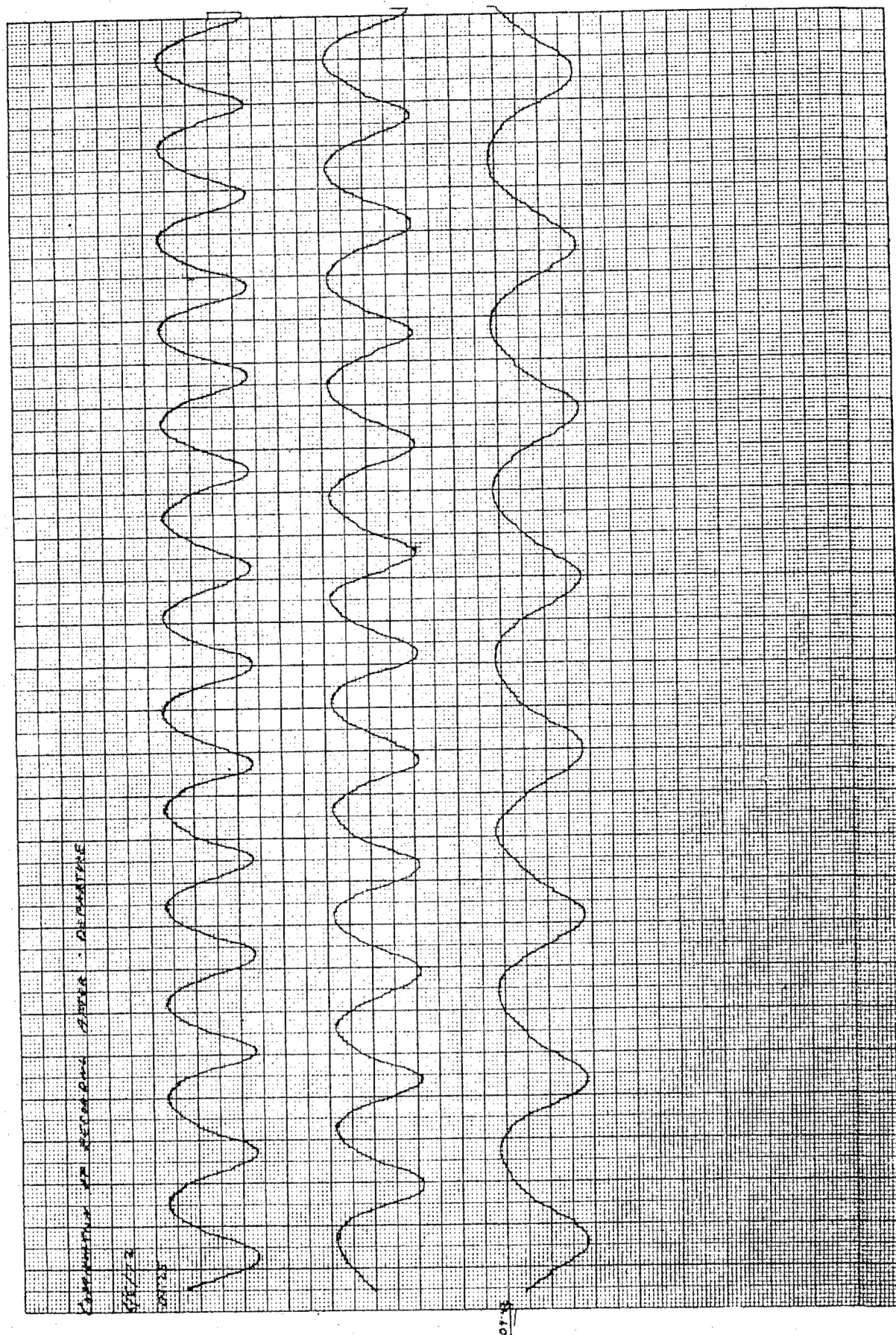


FIGURE 3 RAW DATA, MAGNETOMETER CONTROL RUN

top two traces show a continuing record following termination of the experiment. The third trace was taken some time later, the increase in the period indicating the reduced rate of magnetic field decay. At various times during this and the following day when similar data with Mr. Swann were taken, the experiment was observed by numerous other scientists.

The conditions of this observation, involving as it did a few hours use of an instrument committed to other research, of course prevented a proper investigation. The number of data samples was too few to permit meaningful statistical analysis, and the lack of readily-available multiple recording equipments prevented investigation of possible "recorder only" effects. Therefore, the following longer term study with a similar device was undertaken.

Experiments with a Superconducting Differential Magnetometer (Gradiometer)

A series of experiments were carried out using a Develco Model 8805 superconducting second-derivative gradiometer manufactured by Develco, Inc., Mountain View, California. The assembled device is shown in Figure 4.

Basically, the gradiometer is a four-coil Josephson effect magnetometer device consisting of a pair of coil pairs wound so as to provide a series connection of two opposing first-derivative gradiometers, yielding a second-derivative gradiometer (i.e., a device sensitive only to second and higher order derivative fields.) As a result, the device is relatively insensitive to uniform fields and to uniform gradients. This arrangement allows for sensitive measurement of fields from nearby sources while discriminating against relatively uniform magnetic fields produced by remote sources. The device is ordinarily used to measure magnetic fields originating from processes within the human body, such as action currents in the heart which produce magnetocardiograms. The sensitive tip of the instrument is simply placed near the body area of interest.

In our application, however, the subject is located at a distance of four meters from the gradiometer probe. As a result, the subject is located in a zone of relative insensitivity; e.g., standing up, sitting down, leaning forward, and arm and leg movements produce no signals. From this location the subject is asked, as a mental task, to affect the probe. The results of his efforts are available to him as feedback from three sources: an oscilloscope, a panel meter, and a chart recorder, the latter providing a permanent record.

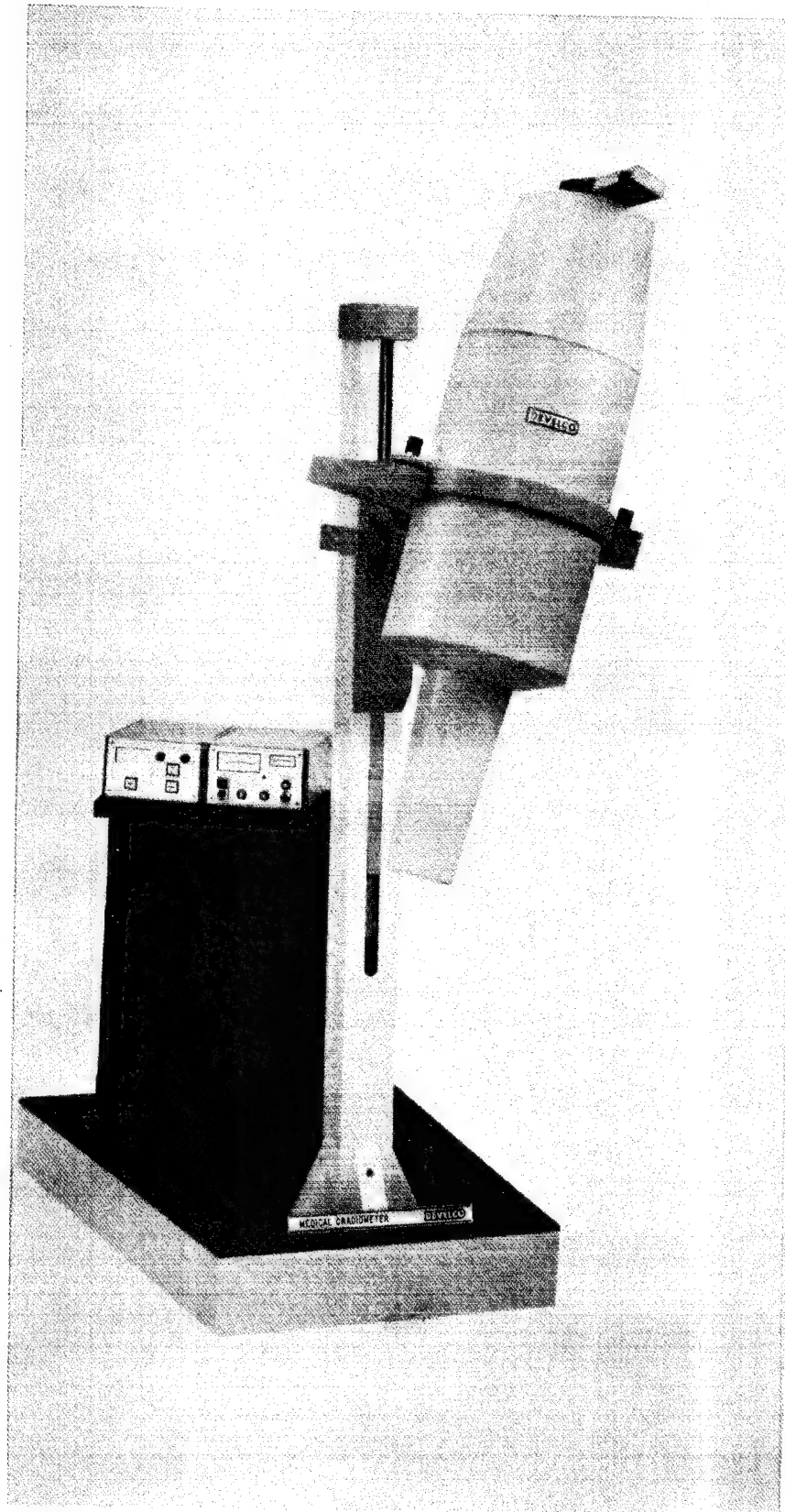


FIGURE 4 SUPERCONDUCTING DIFFERENTIAL MAGNETOMETER

A protocol for subject participation was instituted as follows:

The subject removes all metal objects, and the effects of body movements are checked at the start of each experimental period. The subject then works with the machine in a learning mode, observing effects being produced, if any, via feedback from the instrumentation. Once satisfied that a possibility exists of producing effects on command under experimenter control, the experimenter announces the start of the experiment. A randomization protocol (discussed in the Appendix) is then used to generate ten activity periods of equal length (e.g., twenty-five seconds) pre-determined by the experimenter.

A sample run with a second gifted subject, Mr. Patrick Price, is shown in Figure 5. The randomly-generated ON (activity) periods are Nos. 2, 8, and 9. As observed, signals appear in each of these three periods. The signal appearing in period 9 was strong enough to cause loss of continuous tracking. This latter type of signal can be the result of an exceptionally strong flux change, or an RF burst whether subject-generated or artifactual,* and are handled on the basis of statistical correlation as discussed below. An artifact due to the passage of a truck in the parking lot adjacent to the laboratory (under continuous surveillance by the experimenter) is noted in period 6. Each of the signals on scale corresponds to an input $\sim 1.6 \times 10^{-9}$ Gauss/cm² (second derivative $\partial^2 B_z / \partial z^2$), equivalent to $\sim 3.5 \times 10^{-7}$ Gauss referred to one pickup coil.

* RF interference effects are sometimes in evidence due to proximity to other instrumentation.

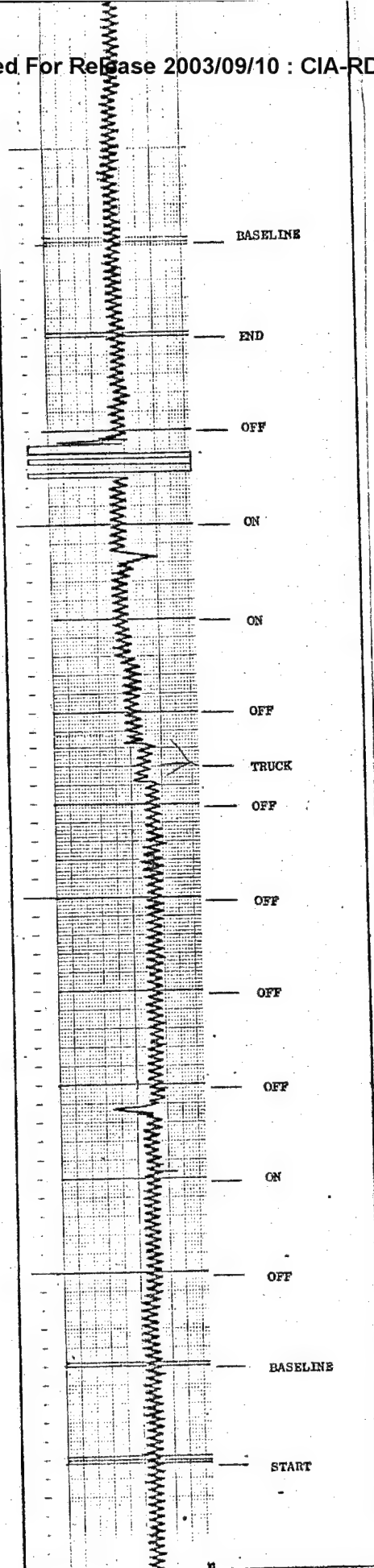


Figure 5 -- Gradiometer data.

The interpretation of such observations must be subjected to careful analysis. For example, the emphasis on "corresponds to" is based on the following: although the probe is designed to register magnetic fields, and the simplest hypothesis is that an observed signal is such, in a task as potentially complex as "psychokinesis", one must be cautious about assigning a given observed effect to a specific cause. Therefore, until further work with multiple measurement employing equally sensitive apparatus, one can only conclude that generation of a magnetic field is the most probable cause.

With regard to signal display, the signal was observed simultaneously on three recording devices, and thus a "recorder only" effect can be considered low probability, although an electronics interference effect ahead of all display cannot be ruled out. We therefore treat the magnetic cause as tentative, although most probable, and concentrate our attention on whether a correlation exists between system disturbances and subject efforts.

Thirteen ten-trial runs were obtained with Mr. Price. Each of the ten trials in the run lasted fifty seconds each,^{*} the activity/no activity command for each trial being generated by the randomization technique discussed in the Appendix. In the $13 \times 10 = 130$ trials, consisting of a random distribution of 64 activity and 66 no-activity periods, 63 events of signal-to-noise ratio > 1 were observed. Of these 63 events, 42 were distributed among the activity periods, 21 among the no-activity periods, a correlation significant at the $p = 0.004$ level.

* With the exception of the first run where 25-second trials were used.

We therefore conclude that the observed number of precisely timed events in pilot work coupled with the statistically significant ($p = 0.004$) correlation between subject effort and signal output in controlled runs indicate a highly probable cause-effect relationship. Thus it appears that a gifted subject can interact with a second derivative magnetic gradiometer of sensitivity $\sim 10^{-9}$ Gauss/cm² from a distance of four meters. Further work would be required to determine absolutely the precise nature of the interaction, although given the equipment design the generation of a magnetic field is the most probable mechanism.

In this series of experiments we examine the possibility that a subject may be able to exert a physical influence on a remotely located physical system. The target is a torsion pendulum suspended by a metal fiber inside a sealed glass bell jar. The pendulum consists of three 100 gram balls arranged symetrically at 120° angles on a 2 cm radius. The entire apparatus is shock mounted, and protected from air currents by the enclosing bell jar.

The angular position of the pendulum is measured by means of an optical readout system. The system consists of a laser beam from a low power argon laser[†] reflected from a small mirror on the pendulum onto a position sensing silicon detector^{††} 1.5 meters from the pendulum. The detector yields an output voltage proportional to spot position. The output from the detector is monitored by a chart recorder^{†††} which provides

The system exhibits a sensitivity of approximately 10 microradians. Under typical experimental conditions random accoustical fluctuations drive the pendulum in its torsional normal mode of 10 second period to a level ~ 100 microradians angular deviation. During control runs the pendulum executes harmonic motion with a maximum variation in amplitude of ± 10 percent over an hour period. Sudden vibrational perturbations in the environment produce oscillation of the pendulum in the vertical plane at a frequency of 1 Hz, as contrasted with the torsional mode in the horizontal plane at 0.1 Hz.

[†] Spectra Physics Model 262

^{††} United Detector Technology Model SC/10

^{†††} Brush Model Mark 200

The subject is asked, as a mental task, to affect the pendulum motion, the results of which would be available as feedback from the chart recorder. The subject is then encouraged to work with the pendulum from a distance of 1 meter, observing effects being produced. If satisfied that there is a possibility of producing effects (typically following a week's activity, a couple of hours per day), an experiment is begun.

As in other experiments, subject efforts to increase or decrease oscillation amplitude are determined by an experimenter utilizing the universal randomization protocol described in (a). Each experiment lasts one hour and consists of six 5-minute work periods alternated with six 5-minute rest periods.

In later work, the subject is removed to a room 12 meters down the hall with three intervening office spaces to determine whether effects can be produced from a remote location. The subject is provided feedback at the remote location either by closed circuit video or by a second chart recorder in parallel with the recorder in the enclosed target laboratory. The remote aspect was instituted both to prevent artifactual effects from body heat, etc., and also to determine whether energy can be coupled via the remote viewing channel to a remote location.[†]

[†] Both experimental evidence and theoretical work indicate that distance may not be a strong factor in paranormal phenomena. See, for example, E.H. Walker "Properties of Hidden Variables in Quantum Theory: Implications for Paraphysics", U.S. Army Ballistic Research Laboratories, Aberdeen Proving Ground, Maryland.

gifted subject located in the same room is able, by concentration, to increase or decrease pendulum motion on command while sitting quietly one meter from the bell jar. The change-to-baseline ratio is often 5:1 or better so the effects are not small. A sample chart showing a rest period followed by a decrease period is given in Figure 6.

Vibrational artifacts can be ruled out on the basis that when such inputs occur, a marked 1 Hz oscillation signal due to vertical motion is superimposed on the 0.1 Hz torsional motion. What is especially interesting are the decreases which take the motion below that generally observed due to environmental noise driving. Such observations indicate the application of a constraint which couples energy out of the pendulum motion. Similar observations have been observed with the subject removed to the second location 12 meters away. Although less pronounced (change-to-baseline ratios typically 2:1), the effect remains easily observable.

The universal randomization protocol is used throughout to determine increase/decrease periods. Control run data are being collected to be subjected to the same analysis. Multiple recording is used throughout to rule out artifacts due to recorder effects. Finally, an electrometer with the base of the bell jar serving as one electrode is monitored to record acoustic vibration independently. Due to the potential significance of such findings, considerable data is being taken in order that the matter can be subjected to statistical analysis over a large sample involving hundreds of work periods. A few hundred data samples have already been collected for this purpose, and the results will be published when available.

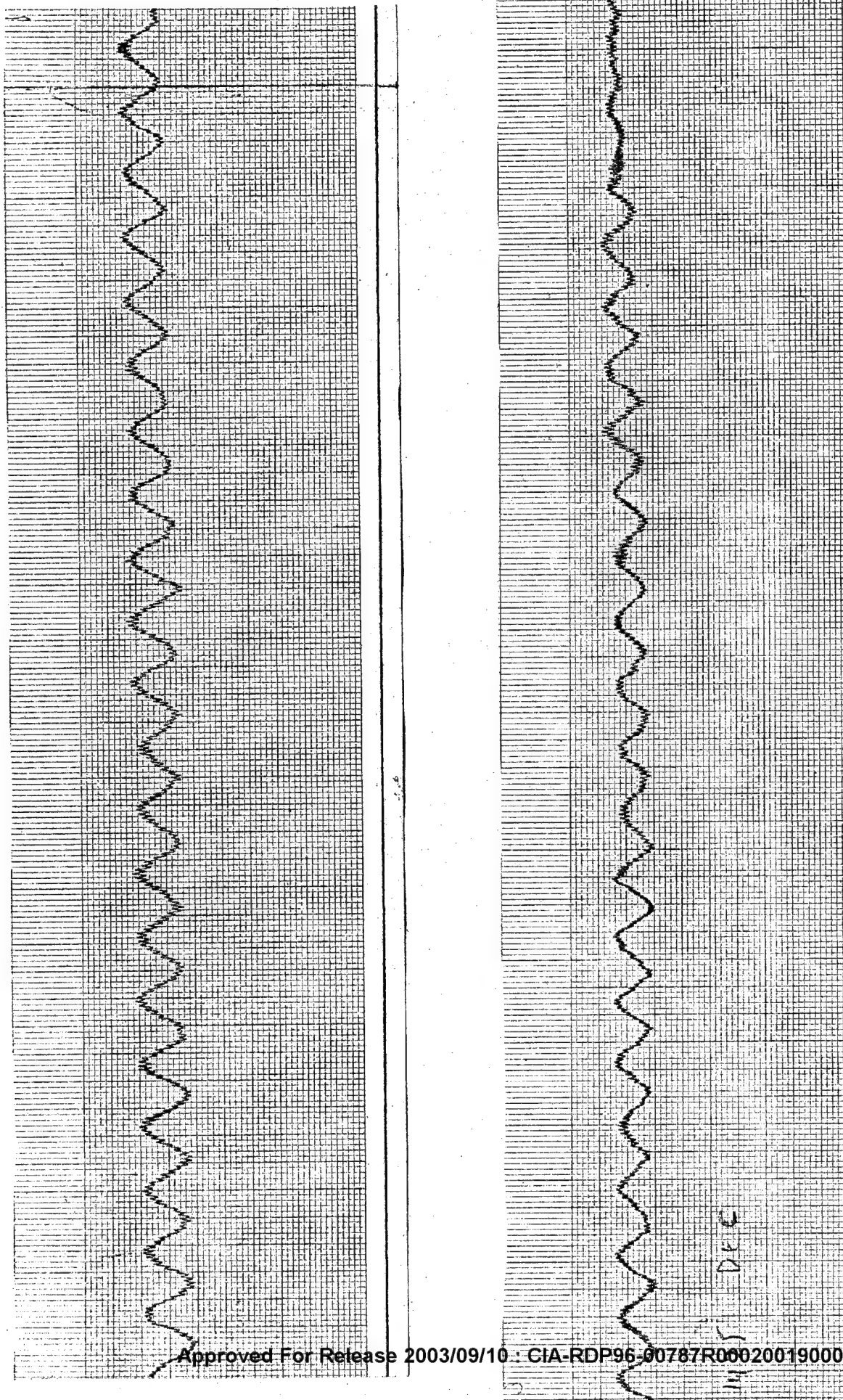


FIGURE 6 PENDULUM MOTION

Large amplitude variation corresponds to 0.1 Hz torsional mode

Speculations

Here we present some speculations about the nature of the paradoxes associated with psychoenergetically-produced physical phenomena. These ideas fall into the category of intuition based on integration of observation over time. Thus, they are not conclusions drawn from statistically significant data, but rather conceptualizations or hypotheses around which specific experiments can be designed.

(1) Researchers in the area of psychokinesis appear to be plagued by results whose amplitudes have a signal-to-noise ratio near unity, regardless of the process or mechanism involved. A number of our observations indicate that, rather than simple perversity, what is being articulated is a coherence phenomena involving partial mobilization of system noise, and thus the magnitude constraint. That is, when a subject is asked to interact with an experimental setup one often first observes a reduction in noise followed by a signal, as if the components of the noise spectrum had been brought into phase coherence.

The subject thus appears to act as a local negentropic source. If true, it may be more advantageous as a practical matter to work with extremely noisy systems, rather than with highly constrained or organized systems, in order to maximize possible effects due to the introduction of order.

(2) Psychokinetic phenomena often appear to be more the result of coincidence than the effect of a well-defined cause. Again, rather than

being the result of the perversity of nature, the observed goal-oriented synchronicity may indicate that physical systems are more easily manipulated at the global level of boundary conditions and constraints rather than at the level of mechanism. Thus, the apparency that a given desired result can be explained away by a coincidental but "natural" event needs to be explored more fully. Unexpected but natural causes may be the effect of a series of causal links, outside the defined experimental boundaries but representing an unforeseen line of least resistance. At worst, such causal links may in fact be unobservable in the sense of the hidden variables concept in quantum theory, but nevertheless, act as instruments of the will.

(3) Psychokinetic phenomena appear to be intrinsically spontaneous; i.e., it is difficult to evoke psychokinetic phenomena "on cue", with the result that the phenomena is often considered to be not under good control, and therefore not amenable to controlled experimentation. This difficulty is so pronounced that it is likely that we are observing some macroscopic analog of a quantum transition, an event similarly unpredictable in time except as a probability function. If the analogy is correct, experimentation in this area simply needs to be treated in the manner of, for example, weak photon experiments.

(4) Possibly related to item (3), the more closely one attempts to observe psychokinetic phenomena, the less likely one is to see it, a

And is absence therefore is most conclusive proof of its presence

factor considered by many to support hypotheses of poor observation, fraud, etc. To a sophisticated observer, however, simple dismissal does not stand up under scrutiny. Invoking again the idea of a macroscopic analog of a quantum transition, we may, as observers of delicate phenomena, be witness to observer effects generally associated with the uncertainty principle. Paradoxically, from the subject's viewpoint, the production of the phenomena may also be an observer effect, perturbing as it does the expected behavior of a piece of instrumentation. In this model the scrutiny of psychokinetic phenomena under laboratory conditions could in principle be considered to be a collective phenomena involving interfering observer effects in a manner known to occur at the microscopic quantum level.

(5) Finally, we find it useful as a guiding principle to recognize that all of the phenomena we deal with in macroscopic psychoenergetics are totally permissible at the microscopic level within the framework of physics as presently understood. It is simply that time reversibility, tunneling through barriers, simultaneous multiple-state occupation, etc., are generally unobservable as gross macroscopic phenomena for statistical reasons only, as codified in the concept of increasing disorder (entropy). Therefore, it may be appropriate to consider an individual with psychokinetic abilities primarily as a source of ordering phenomena of sufficient magnitude so as to restructure the otherwise random statistics of the macroscopic environment.

Universal Randomization Protocol

It was deemed desirable in our work to establish a universal randomization protocol independent of the particular experiment under consideration. The only exceptions were to be automated experiments where target selection is determined by radioactive decay or electronic randomization.

The randomization procedure is designed around a ten-unit base, e.g., ten targets, ten work periods, etc. A ten-digit sequence governing an experiment is blind to both experimenter and subject, and is uncovered by means of the following procedure. A three-page RAND Table of Random Digits (Table 1) is entered to obtain the ten-digit sequence, the entrance point being determined by four throws of a die,[†] the first 1, 2, or 3 determining page, the next 1, 2, 3, or 4 determining column block, and the final throw determining from which of the first six rows in the block the ten-digit sequence is to be taken. An opaque card with a single-digit window is then moved across the row to uncover digits one at a time. If a multiplicity of targets exist, the digits 0 through 9 are employed directly. If a binary command is required (e.g., increase/decrease or activity/no activity) the parity of the digit (even or odd) is employed.

[†] A technique found in control runs to produce a distribution of die faces differing nonsignificantly from chance expectation.

Table of Random Digits *

CPYRGHT

11 16 43 63 18	75 06 13 76 74	40 60 31 61 52	83 23 53 73 61
21 21 59 17 91	76 83 15 86 78	40 94 15 35 85	69 95 86 09 16
10 43 84 44 82	66 55 83 76 49	73 50 58 34 72	55 95 31 79 57
36 79 22 62 36	33 26 66 65 83	39 41 21 60 13	11 44 28 93 20
73 94 40 47 73	12 03 25 14 14	57 99 47 67 48	54 62 74 85 11
49 56 31 28 72	14 06 39 31 04	61 83 45 91 99	15 46 98 22 85
64 20 84 82 37	41 70 17 31 17	91 40 27 72 27	79 51 62 10 07
51 48 67 28 75	38 60 52 93 41	58 29 98 38 80	20 12 51 07 94
99 75 62 63 60	64 51 61 79 71	40 68 49 99 48	33 88 07 64 13
71 32 55 52 17	13 01 57 29 07	75 97 86 42 98	08 07 46 20 55
65 28 59 71 98	12 13 85 30 10	34 55 63 98 61	88 26 77 60 68
17 26 45 73 27	38 22 42 93 01	65 99 05 70 48	25 06 77 75 71
95 63 99 97 54	31 19 99 25 58	16 38 11 50 69	25 41 68 78 75
61 55 57 64 04	86 21 01 18 08	52 45 88 88 80	78 35 26 79 13
78 13 79 87 68	04 68 98 71 30	33 00 78 56 07	92 00 84 48 97
62 49 09 92 15	84 98 72 87 59	38 71 23 15 12	08 58 86 14 90
24 21 66 34 44	21 28 30 70 44	58 72 20 36 78	19 18 66 96 02
16 97 59 54 28	33 22 65 59 03	26 18 86 94 97	51 35 14 77 99
59 13 83 95 42	71 16 85 76 09	12 89 35 40 48	07 25 58 61 49
29 47 85 96 52	50 41 43 19 66	33 18 68 13 46	85 09 53 72 82
96 15 59 50 09	27 42 97 29 18	79 89 32 94 48	88 39 25 42 11
29 62 16 65 83	62 96 61 24 68	48 44 91 51 02	44 12 61 94 38
12 63 97 52 91	71 02 01 72 65	94 20 50 42 59	68 98 35 05 61
14 54 43 71 34	54 71 40 24 01	38 64 80 92 78	81 31 37 74 00
83 40 38 88 27	09 83 41 13 33	04 29 24 60 28	75 66 62 69 54
67 64 20 52 04	30 69 74 48 06	17 02 64 97 37	85 87 51 21 39
64 04 19 90 11	61 04 02 73 09	48 07 07 68 48	02 53 19 77 37
17 04 89 45 23	97 44 45 99 04	30 15 99 54 50	83 77 84 61 15
93 03 98 94 16	52 79 51 06 31	12 14 89 22 31	31 36 16 06 50
82 24 43 43 92	96 60 71 72 20	73 83 87 70 67	24 86 39 75 76
96 99 05 52 44	70 69 32 52 55	73 54 74 37 59	95 63 23 95 55
09 11 97 48 03	97 30 38 87 01	07 27 79 32 17	79 42 12 17 69
57 66 64 12 04	47 58 97 83 64	65 12 84 83 34	07 49 32 80 98
46 49 26 15 94	26 72 95 82 72	38 71 66 13 80	60 21 20 50 99
08 43 31 91 72	08 32 02 08 39	31 92 17 64 58	73 72 00 86 57
10 01 17 50 04	86 05 44 11 90	57 23 82 74 64	61 48 75 23 29
92 42 06 54 31	16 53 00 55 47	24 21 94 10 90	08 53 16 15 78
35 54 25 58 65	07 30 44 70 10	31 30 94 93 87	02 33 00 24 76
86 59 52 62 47	18 55 22 94 91	20 75 09 70 24	72 61 96 66 28
72 11 53 49 85	58 03 69 91 37	28 53 78 43 95	26 65 43 78 51

* This table appears through the courtesy of The RAND Corporation and the McGraw-Hill Book Company, Inc. and is reprinted by permission from The Compleat Strategist, by J. D. Williams, pp. 219-221 [44].

CPYRGHT

07 42 85 88 63	96 02 38 89 36	97 92 94 12 20	86 43 19 44 85
35 37 92 79 22	28 90 65 50 13	40 56 83 32 22	40 48 69 11 22
10 98 22 28 07	10 92 02 62 99	41 48 39 29 35	17 06 17 82 52
90 12 73 33 41	77 80 61 24 46	93 04 06 64 76	24 99 04 10 99
63 00 21 29 90	23 51 06 87 74	76 86 93 93 00	84 97 80 75 04
40 77 98 63 82	48 45 46 52 69	02 98 25 79 91	50 76 59 19 30
43 21 61 26 08	18 16 78 46 31	94 47 97 65 00	39 17 00 66 29
96 16 76 43 75	74 10 89 36 43	52 29 17 58 22	95 96 69 09 47
70 97 56 26 93	35 68 47 26 07	03 68 40 36 00	52 83 15 53 81
85 81 26 18 75	23 57 07 57 54	58 93 92 83 66	86 76 56 74 65
37 10 06 24 92	63 64 24 76 38	54 72 35 65 27	53 07 63 82 35
53 40 61 38 55	38 51 92 95 00	84 82 88 12 48	25 54 83 40 75
55 17 28 15 56	18 85 65 90 43	65 79 90 19 14	81 36 30 51 73
40 35 38 48 07	47 76 74 68 90	87 91 73 85 49	48 21 37 17 08
18 89 90 96 12	77 54 15 76 75	26 90 78 81 73	71 18 92 83 77
68 14 12 53 40	92 55 11 13 26	68 05 26 54 22	88 46 00 63 52
51 55 99 11 59	81 31 06 32 51	42 58 76 81 49	88 14 79 97 00
92 21 43 33 86	73 45 97 93 59	97 17 65 54 16	67 64 20 50 51
15 08 95 05 57	33 16 68 70 94	53 29 58 71 33	38 26 49 47 08
96 46 10 06 04	11 12 02 22 54	23 01 19 41 08	29 19 66 51 87
28 17 74 41 11	15 70 57 38 35	75 76 84 95 49	24 54 36 32 85
66 95 34 47 37	81 12 70 74 93	86 66 87 03 41	66 46 07 56 48
19 71 22 72 63	84 57 54 98 20	56 72 77 20 36	50 34 73 35 21
68 75 66 47 57	19 98 79 22 22	27 93 67 80 10	09 61 70 44 08
75 02 26 53 32	98 60 62 94 51	31 99 46 90 72	37 35 49 30 25
11 32 37 00 69	90 26 98 92 66	02 98 59 53 03	15 18 25 01 66
53 20 86 34 70	18 15 82 52 83	89 96 51 02 06	95 83 09 54 06
11 47 40 87 86	05 59 46 70 45	45 58 72 96 11	98 57 94 24 81
81 42 28 68 42	60 99 77 96 69	01 07 10 85 30	74 30 57 75 09
21 77 17 59 63	23 15 19 02 74	90 20 96 85 21	14 29 33 91 94
42 27 81 21 60	32 57 61 42 78	04 98 26 84 70	27 87 51 54 80
17 69 76 01 14	63 24 73 20 96	19 74 02 46 37	97 37 73 21 12
05 68 63 02 43	34 13 40 29 36	50 19 77 98 69	86 49 76 87 09
52 99 24 66 50	89 91 05 73 95	46 95 46 75 36	28 96 88 19 36
94 51 89 39 84	81 47 86 77 50	82 54 96 26 76	31 12 34 98 99
00 18 47 21 86	78 90 67 54 89	61 79 88 16 00	80 01 88 47 42
87 46 26 31 65	79 81 66 16 30	57 66 62 90 55	46 51 80 14 87
88 69 25 87 16	12 27 34 81 76	29 80 56 49 94	66 87 26 22 30
20 09 44 29 62	41 38 21 67 68	06 71 13 49 39	19 59 97 62 47
60 93 58 15 04	50 52 08 21 53	13 93 44 68 85	58 31 58 83 66

CPYRGHT

51 39 28 59 36	43 89 85 05 96	28 54 99 83 27	99 94 32 53 77
54 23 94 19 18	79 52 64 62 74	40 87 16 18 03	25 76 75 54 84
57 89 27 33 94	07 16 09 02 62	47 70 43 83 55	71 70 88 01 17
02 33 07 47 36	53 27 44 44 68	62 61 11 96 98	09 30 42 92 65
76 11 52 92 47	55 34 25 12 99	03 04 78 39 81	11 91 60 92 67
63 31 28 18 86	29 08 52 01 01	26 46 05 05 01	31 73 11 89 38
27 63 22 15 70	34 27 45 64 26	01 76 42 59 59	69 29 38 98 75
06 33 56 21 11	44 01 45 25 67	11 76 25 48 06	02 65 15 29 12
64 14 28 76 76	21 35 88 87 73	31 73 63 16 95	11 52 36 42 13
28 43 62 54 68	75 23 57 53 70	97 15 54 87 06	52 23 92 18 31
09 52 28 38 55	85 97 31 58 88	31 18 14 96 72	17 23 70 40 24
93 71 41 54 14	93 71 20 27 42	32 11 58 26 83	67 18 28 90 30
15 68 15 35 99	58 18 57 38 40	07 06 87 59 47	71 74 36 92 85
77 71 22 39 14	08 90 74 37 68	26 62 27 41 84	75 16 69 67 48
78 45 35 48 44	61 50 90 12 45	02 80 55 26 76	22 51 94 78 48
24 86 06 82 84	19 36 72 90 73	32 30 15 87 01	04 19 33 01 42
37 28 40 68 44	78 88 75 72 76	26 33 95 69 09	39 33 14 21 01
35 48 85 24 73	37 63 43 25 69	95 27 40 95 08	81 01 24 24 13
51 59 55 99 09	35 22 34 49 91	24 27 53 96 32	09 77 79 88 00
90 66 03 51 71	30 02 19 11 20	36 11 64 21 28	65 40 19 41 99
47 50 50 20 08	20 30 08 71 88	96 19 50 70 59	13 26 63 13 89
13 35 00 84 14	64 04 99 43 77	22 40 89 49 58	19 09 55 80 35
33 00 69 26 90	69 24 89 74 43	53 89 62 35 08	16 22 75 69 29
55 21 66 38 86	06 80 41 18 61	22 56 50 24 75	00 25 87 90 18
21 99 12 62 28	14 80 11 91 92	49 43 82 07 72	60 84 66 97 32
71 02 52 82 12	10 47 42 75 22	65 62 03 46 84	00 21 00 48 63
65 52 21 52 42	84 55 47 45 60	20 24 62 69 41	41 29 80 47 63
27 97 55 49 23	90 65 00 61 70	09 43 30 91 67	35 16 63 27 31
07 30 00 97 04	36 09 96 15 77	95 55 27 34 56	16 57 88 81 40
54 35 71 36 89	19 56 90 38 14	76 05 30 51 50	69 12 56 94 42
00 97 70 44 81	42 04 40 86 49	34 82 23 58 43	78 46 88 23 80
13 92 07 87 61	12 31 19 28 08	07 75 30 40 73	58 52 08 00 22
08 39 53 70 43	37 88 03 41 72	04 20 49 44 34	62 79 88 19 02
46 16 66 72 06	01 61 94 37 69	96 77 01 94 40	29 70 04 20 93
87 76 77 76 07	03 74 20 16 13	65 98 96 28 43	10 91 73 44 58
29 88 09 52 88	21 64 44 65 87	06 64 49 47 84	66 99 56 18 12
36 24 83 66 66	14 89 45 92 73	88 95 04 60 77	34 65 11 20 38
12 38 62 96 56	30 47 42 59 64	21 48 29 54 22	02 00 23 36 71
52 06 87 38 01	52 18 81 94 91	55 13 76 10 39	02 00 66 99 13
41 72 75 21 71	56 71 90 60 54	98 44 18 15 29	59 60 76 52 25